Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

A POSSIBLE INTERMEDIATE HOST OF *FASCIOLA HEPATICA* L. 1758 IN NORTH AMERICA*

MARK F. BOYD

Liver fluke disease of sheep and cattle caused by *Fasciola hepatica* L. 1758 is cosmopolitan in its distribution. According to Hall (1917), in the United States this disease is fairly well established along parts of the Pacific, the Gulf and eastern Atlantic coasts. Francis (1891) has definitely outlined its distribution in Texas. He states that: "This well known parasite occurs in the livers of cattle, sheep and goats of Texas in sufficient numbers to cause great damage. The portion of the state permanently infected consists of the coast counties and river bottoms."

The complicated life cycle of the fluke was first worked out in Europe by Creplin, Weinland, Leuckart and Thomas, and is too well known to require repetition. They found the larval stages to be passed in a small snail, *Limnaea truncatula.* According to Stiles, Leuckart also showed that the redia, but not the cercaria, would develop in *Limnaea peregra.* He also states that Lutz observed that in the Hawaiian islands both *L. oahuensis* and *L. rubella* serve as intermediate hosts. Stiles (1894-95) pointed out that none of these closely allied species of snails are found in America, while fluke disease is found in both North and South America, and concludes that there is either on this continent some other species of snail which may act as intermediate host, or some of the species described in America must be identical with some of the above named forms. He also advanced the view that in North America suspicion would especially fall upon *Limnaea humilis,* Say.

So far as we are aware, observations of the intermediate stages (sporocyst, redia, cercaria) of *F. hepatica* have never been recorded from any snail in North America. *L. humilis,* as suggested by Stiles, has been generally regarded as the intermediate host, but the fact has not been established. In view of the importance of this well known parasite, it seems surprising that this uncertainty regarding its North American intermediate host has not been cleared.

From time to time sheep have been grazed on Galveston island, and fluke disease has appeared among them. It therefore appeared probable that a suitable intermediate host must exist upon the island. Collections of fresh water snails from ephemeral pools on the island revealed the existence of three species, which were identified by Mr. H. B. Hannibal of San Francisco as: *Limnaea humilis,* Say, *Physa fontinalis acuta,* Drap., and *Succinea grosvenorii,* Lea.

---

* Contribution Number 4, from the Laboratory of Bacteriology and Preventive Medicine, Medical Department, University of Texas.

Owing to the general view that *Limnaea humilis* is the intermediate host, it appeared that infection experiments designed to clear up this point would be of value. A limited supply of the living ova of *F. hepatica* were secured through the kindness of Prof. A. C. Chandler of Rice Institute, collected from the bile ducts of cattle and sheep at the Houston abattoir. A collection of adult fresh water snails was made on the island in the middle of December and kept alive in an aquarium, with the hope that they would spawn, and provide an adequate supply of young snails. Both *L. humilis* and *P. fontinalis* were represented in the collection. The *Limnaea* died in about two weeks without spawning. On the other hand, the *Physa* survived considerably longer and by Dec. 27 had deposited several masses of spawn.

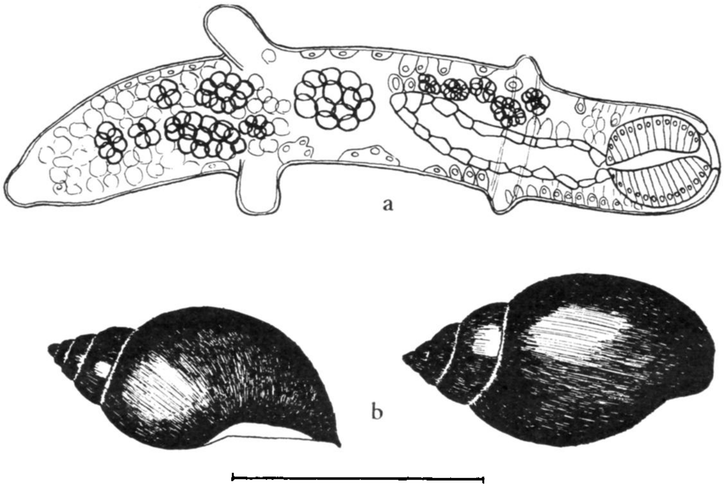

Figure a.—Sketch of living redia of *Fasciola hepatica.* Length 560 micra.
Figure b.—Dorsal and lateral view of shell of *Physa fontinalis acuta,* Drap. Length of scale 10 mm.

The egg masses were transferred to a beaker containing tap water and algae, which was kept at room temperature, and were all hatched out by the middle of January. After all the young snails had emerged, a heavy suspension of *F. hepatica* ova was added to the beaker on January 16. At that time there were approximately 100 active young *Physa* in the beaker, about 1 mm. in length. On January 27 it was observed that the majority of the snails were dead and there were less than two dozen survivors. The remainder were examined at varying intervals for larval stages of *F. hepatica,* by crushing them on a slide under a cover glass in a drop of the aquarium water. The records of these examinations follow:

Date	No. Snails Crushed	Results of Examination
1/27/20	2	Negative
2/ 2/20	2	Negative
2/12/20	3	Negative
2/20/20	1	Found two rediae
2/27/20	3	Found three rediae in one snail
3/10/20	5	Found eleven rediae in one snail
3/12/20	4	Negative

All of the fluke ova employed were apparently fertile, as none were observed in the aquarium by February 12 with the operculum in place, showing that a miricidium probably emerged from each ovum.

The rediae were apparently in the digestive gland of the snail. The appearance of a single redia is shown in figure *a.* They were as actively motile as could be expected, since they were under compression. Contraction and expansion of the body was marked in all, together with contraction and expansion of the muscular pharynx. The blind gut was filled with cellular debris evidently derived from the digestive gland of the snail. When contracted they measured about 450 micra in length, and when expanded, about 560 micra. The space between the cuticle and gut contained several masses of germinal cells. In none were cercariae found.

It is to be regretted that we failed to secure a sufficient number of infected *Physa* so as to prolong the observations to determine whether cercariae would develop and emerge. As it is, the data presented do not enable us to conclude that the larval cycle can be completed in *Physa,* nor settle the question regarding *L. humilis.* Later in the season when we did secure a small brood of *L. humilis* from spawn, we were unable to secure any fluke eggs.

In this connection, some statements by Gilchrist (1918) are of interest. He states that in South Africa the commonest fresh water snail is *Physa* (*Isidora*) *tropica* and that in them are found abundant stages of a fluke very closely resembling those of the liver fluke. He also states that in Australia the intermediate host of the liver fluke is believed to be a species of *Physa.*

REFERENCES CITED

Francis, M. 1891.—Liver flukes: The common fluke (*Distomum hepaticum*), a new species (*Distomum texanicum*). Bull. Texas Agr. Exp. Sta. 18:127-136, 8 pls.

Gilchrist, J. D. F. 1918.—The life history of *Distoma luteum*, n. sp., with notes on some cercariae and rediae found in S. Africa. Parasitology, 10:311-319.

Hall, M. C. 1912.—Our present knowledge of the distribution and importance of some parasitic diseases of sheep and cattle in the United States. Circ. Bur. An. Ind., 193:419-463, 2 pls.

Stiles, C. W. 1894-95.—The anatomy of the large American fluke (*Fasciola magna*), and a comparison with other species of the genus Fasciola, s. st. Jour. Comp. Med. and Vet. Arch. 15:161-178, 225-243, 299-313, 407-417, 457-462.

Stiles, C. W. 1898.—The flukes and tapeworms of cattle, sheep and swine, with special reference to the inspection of meats. Bull. Bur. An. Ind., 19:11-136, 124 figs.